(12) UK Patent Application (19) GB (11) 2 290 927 (13) A

(43) Date of A Publication 10.01.1996

(21) Application No 9513340.1

(22) Date of Filing 30.06.1995

(30) Priority Data
(31) 06171724 (32) 30.06.1994 (33) JP

(71) Applicant(s)
NEC Corporation

(Incorporated in Japan)

7-1 Shiba 5-chome, Minato-ku, Tokyo, Japan

(72) Inventor(s)
Naoki Hirasawa

(74) Agent and/or Address for Service
Reddie & Grose
16 Theobalds Road, LONDON, WC1X 8PL,
United Kingdom

(51) INT CL^6
H04Q 7/32

(52) UK CL (Edition O)
H4L LECTP

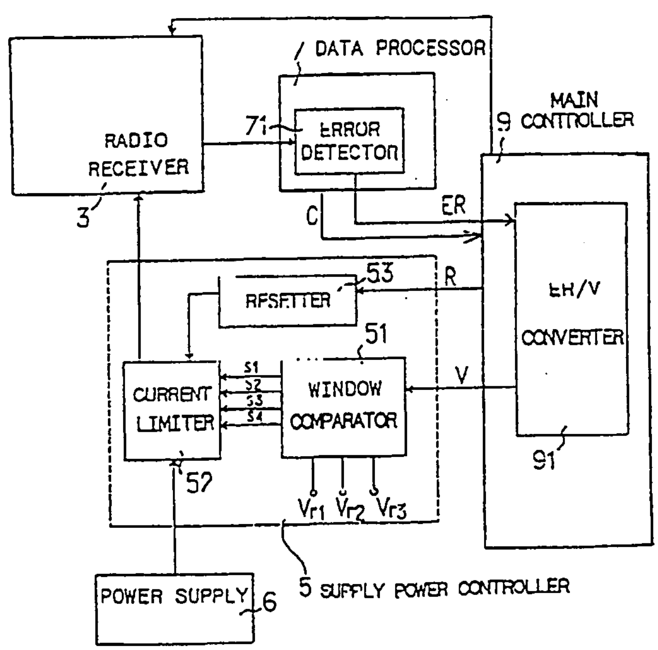
(56) Documents Cited
GB 2261140 A GB 2250402 A

(58) Field of Search
UK CL (Edition N) G4H HRCA, H4L LECTP
INT CL^6 H04M 1/72, H04Q 7/18 7/32
Online: WPI

(54) Control of standby power in a mobile radio receiver

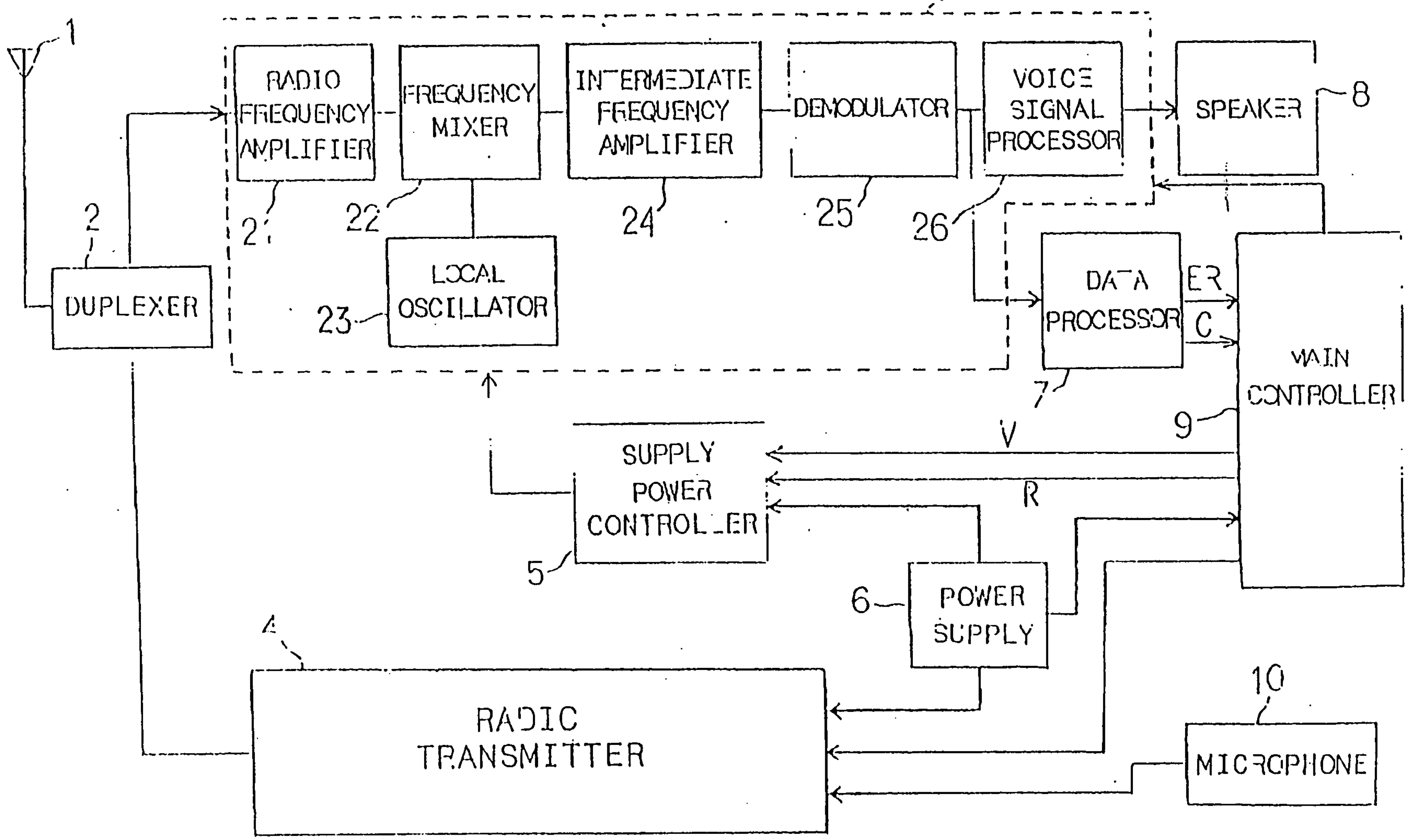
(57) A mobile radio communication system contains a radio receiver 3 for receiving a radio wave transmitted from a base station to produce an input signal, and a supply power controller 5 for controlling the power supplied to the radio receiver. An error detector 71 detects errors generated in a received control signal. The supply power controller then reduces the power supplied to the radio receiver during standby time to a level determined by the appearance of errors in the control signal, for example in response to the error rate. The system optionally contains a resetter which operates when a call is received or transmitted to stop the power reduction action of the supply power controller.

FIG.2



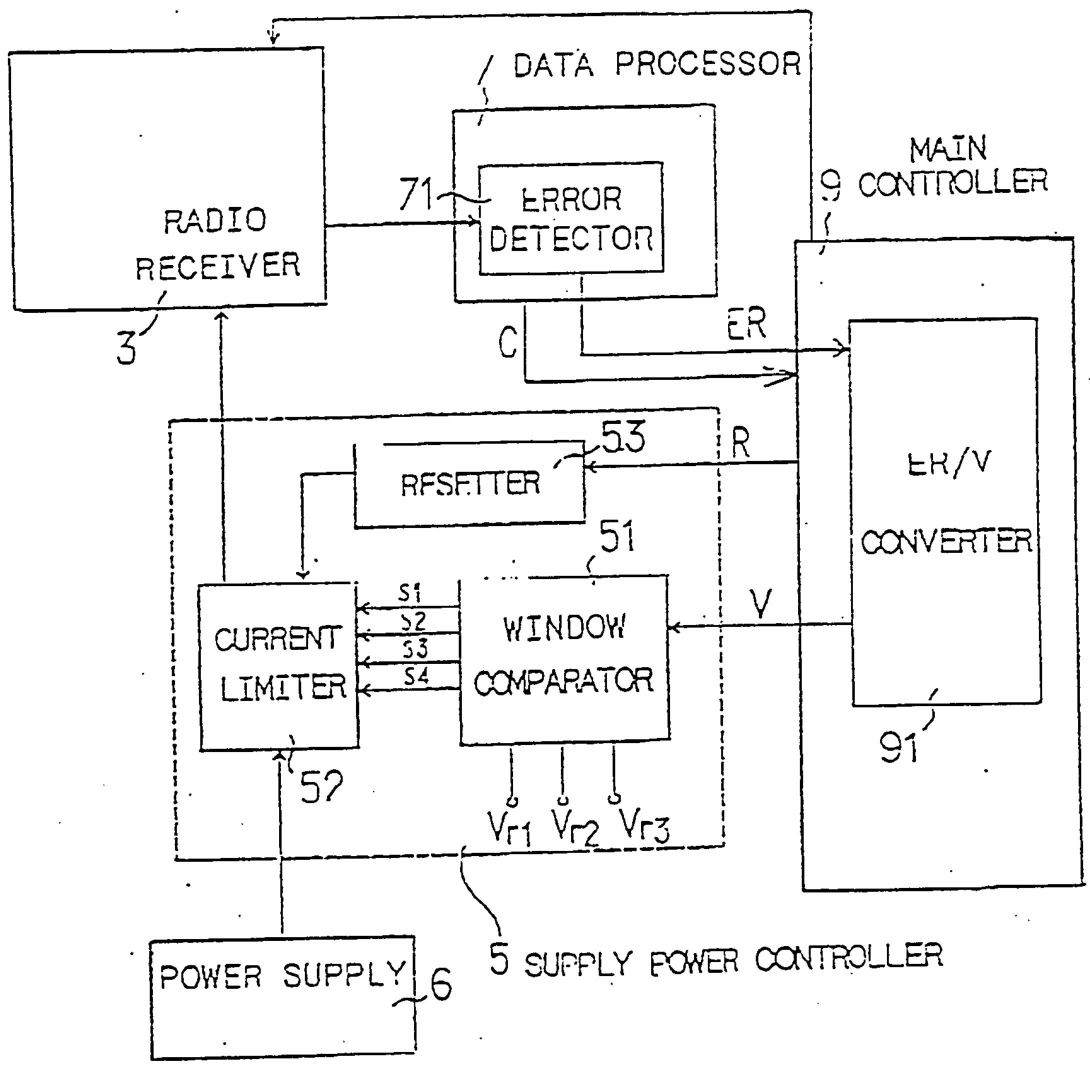
GB 2 290 927 A

FIG. 1



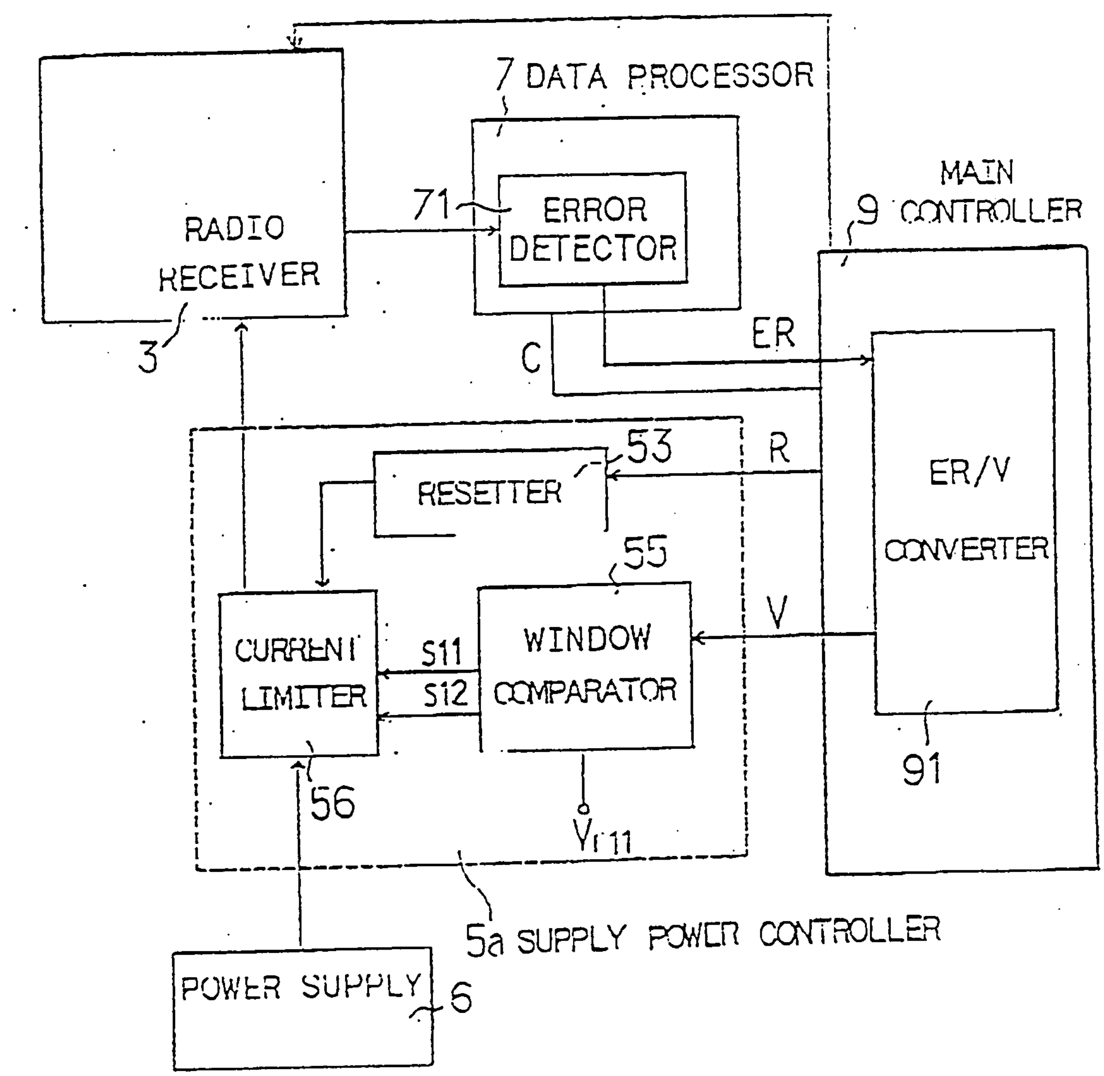
3 RADIO RECEIVER
1
2
DUPLEXER
RADIO FREQUENCY AMPLIFIER
21
FREQUENCY MIXER
22
LOCAL OSCILLATOR
23
INTERMEDIATE FREQUENCY AMPLIFIER
24
DEMODULATOR
25
VOICE SIGNAL PROCESSOR
26
SPEAKER
8
DATA PROCESSOR
7
ER
C
MAIN CONTROLLER
9
V
R
SUPPLY POWER CONTROLLER
5
POWER SUPPLY
6
4
RADIO TRANSMITTER
MICROPHONE
10

FIG.2



DATA PROCESSOR
RADIO RECEIVER
3
71
ERROR DETECTOR
MAIN
9 CONTROLLER
ER
C
R
53
RESETTER
51
ER/V CONVERTER
V
S1
S2
S3
S4
CURRENT LIMITER
WINDOW COMPARATOR
91
52
Vr1 Vr2 Vr3
5 SUPPLY POWER CONTROLLER
POWER SUPPLY
6

FIG.3



RADIO RECEIVER
3
7 DATA PROCESSOR
71
ERROR DETECTOR
ER
C
MAIN CONTROLLER
9
ER/V CONVERTER
91
R
V
RESETTER
53
55
WINDOW COMPARATOR
CURRENT LIMITER
S11
S12
56
V_{r11}
5a SUPPLY POWER CONTROLLER
POWER SUPPLY
6

MOBILE RADIO COMMUNICATION SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a radio communication system and more particularly, to a mobile radio communication system that enables to reduce power consumption during a standby time for waiting a call from a base radio station without reception performance deterioration.

2. Description of the Prior Art

Conventionally, to reduce power consumption of a mobile radio communication system during a standby time, it has been known well that a radio receiver block of the system is controlled to be active intermittently, reducing the effective consumption power. With this method, for example, a control block of the system feeds a signal into a power-supply controller circuit of the system at specified intervals so that the receiver block becomes active or inactive in response to the signal.

With this conventional method, however, some control protocol is required in advance to communicate between the system and any base station. If the system operates without the protocol, there is a possibility that it fails to receive necessary signals from the base station.

To solve this problem, other methods have been developed under the estimate or expectation that slight sensitivity reduction of the radio receiver does not cause any problem. An example of the methods is disclosed in the Japanese Non-Examined Patent Publication No. 57-33846 (published in February, 1982), in which the sensitivity of the radio receiver block is reduced during a standby time and is returned to the original or normal value at the time of reception of a calling signal, resulting in reduction of power consumption.

During the standby time, a radio wave intercepted by an antenna is supplied to a radio receiver circuit through a radio-frequency (RF) attenuator. An input level of the receiver circuit is reduced by the attenuator. Consequently, only a strong radio wave transmitted from a specific area is detected and the other weak radio waves having the same frequency as the strong radio wave are not detected. A detector circuit detects the output of the receiver circuit and judges whether the demodulated output contains a call signal for the radio receiver or not.

When the call signal is received, the radio wave intercepted by the antenna is supplied to the radio receiver circuit without passing through the attenuator, maximizing the sensitivity of the receiver circuit. The demodulated output

of the receiver circuit is supplied to an audio-frequency (AF) amplifier. Thus, the amplified output of the AF amplifier drives a speaker.

Another example of the methods is disclosed in the Japanese Non-Examined Patent Publication No. 63-13525 (published in January, 1988), in which a supply current to a receiver block is reduced under the condition that the receiver block has a sensitivity sufficient to detect a wanted RF signal, resulting in reduction of power consumption.

A RF signal intercepted by an antenna is supplied to a radio receiver block through a duplexer. The receiver block contains a RF amplifier, a frequency converter, an intermediate-frequency (IF) amplifier, and an AF amplifier. The AF amplifier has a demodulator and a noise or electric-field squelch circuit.

A part of the output of the receiver block, which changes dependent on whether any RF signal is contained therein, is supplied to a main controller. As the part of the output, an output of the noise or electric-field squelch circuit is used typically. Another part thereof, which is a voice signal containing a call signal or the like, is supplied to a current controller for controlling a supply current to the receiver block. The main controller controls a radio

transmitter block. The main controller controls the receiver block also through the current controller.

The transmitter block supplies a RF output signal to the antenna through the duplexer under the control of the main controller.

A power supply, which is typically made by a dry or storage battery or batteries, supplies a power to the main controller, the transmitter block and the current controller.

Since no RF signal is supplied to the receiver block during a standby time, the current controller reduces the supply current to the receiver block under the condition that the receiver block has a sensitivity sufficient to be able to detect a wanted RF signal to drive the squelch circuit.

Even if the supply current to the receiver block is reduced, the sensitivity of the receiver block does not tend to decrease so much. This means that such the supply current reduction of the block causes no problem for detecting the wanted RF signal.

When any wanted RF signal is intercepted by the antenna,the receiver block sends a signal to the current controller, so that the controller increases the supply current to the receiver block in response to this signal. Thus, the receiver block starts its normal operation.

For the above conventional methods in which power

consumption reduction is realized by the sensitivity reduction of the radio receiver during the standby time, it is important to know the level to which the sensitivity can be lowered. This level is not disclosed clearly nor specifically in the method of the Japanese Non-Examined Patent Publication No. 57-33846,

In the method of the Japanese Non-Examined Patent Publication No. 63-13525 also, this sensitivity level is not shown clearly nor specifically. In view of this, the power consumption reduction is obliged to be performed without precise estimate of the sensitivity level. As a result, there arises a possibility that any RF signal transmitted from a base station fails to be received due to power consumption reduction. Alternatively, the sensitivity reduction is restrained because the reception of the RF signal is regarded as important, resulting in insufficient or no power consumption reduction.

Further, if the power consumption reduction is excessively progressed according to the above conventional methods, there arises a danger that the performance of the communication system deteriorates instead, degrading the marketability of the system.

SUMMARY OF THE INVENTION

A mobile radio communication system according to the present invention contains a radio receiver for receiving a radio wave transmitted from a base station to produce an input signal, and a supply power controller for controlling a supply power supplied to the radio receiver.

An error detector is provided for detecting an error in a control signal containing an input signal.

A supply power controller is further provided for controlling to reduce a supply power to the radio receiver during a standby time according to appearance of errancy of the control signal.

Accordingly, the present invention may advantageously provide a mobile radio communication system in which power consumption can be reduced during standby time when waiting for a call from a base radio station without significant reception performance deterioration.

The error detector preferably detects to calculate an error rate of the control signal, and the supply power controller controls to change the supply power according to the result of comparison.

The system may further comprise a resetter for stopping supply power reduction action of the supply power controller. The resetter is driven at reception of a call signal and at transmission.

With the mobile communication system according to the invention, the supply current to the radio receiver block is reduced or limited according to appearance of errancy of the received control signal. For this reason, the supply power can be controlled objectively and automatically corresponding to the actual reception state of the receiver block.

As a result, the supply power can be reduced as much as possible under the condition that the radio wave from the base station is ensured to be received, providing the satisfactory effect or advantage of the power consumption reduction without reception performance deterioration.

In addition, if the resetter is provided in the supply power controller to stop the supply current reduction by a reset signal, the native power can be supplied to the receiver block promptly at the call signal reception and the radio signal transmission.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic, functional block diagram of a mobile radio communication system according to a first embodiment of the present invention.

Fig. 2 is a schematic, functional block diagram showing the power supply controller and its vicinity of the system of Fig. 1.

Fig. 3 is a schematic, functional block diagram showing the power supply controller and its vicinity of a mobile radio communication system according to a second embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Preferred embodiments of the present invention will be described below while referring to the drawings attached.

FIRST EMBODIMENT

As shown in Fig. 1, a mobile radio communication system according to a first embodiment of the invention contains an antenna 1, a duplexer 2, a radio receiver block 3, a radio transmitter block 4, a supply power controller 5, a power supply 6, a data processor 7, a speaker 8, a main controller 9 and a microphone 10.

The antenna 1 intercepts a radio wave containing a coded control signal and/or a voice signal, resulting in an RF input signal.

The duplexer 2 is used for duplexing the antenna 1 for transmission and reception.

The radio receiver block 3 receives the RF input signal and reproduces the voice signal contained therein through the speaker 8. Also, the receiver block 3 sends the coded control signal contained in the input signal to the data

processor 7 provided outside the receiver block 3.

The radio transmitter block 4 RF-amplifies, frequency-converts and power-amplifies a voice signal produced by the microphone 10 and then, transmits the amplified voice signal to the atmosphere through the duplexer 2 and antenna 1.

The power supply 6, which is typically made of a dry or storage battery or batteries, supplies an electric power to the radio receiver block 3 through the supply power controller 5. The power supply 6 feeds respective electric powers to the main controller 9 and the radio transmitter block 4, also.

The supply power controller 5 controls the supply power to the radio receiver block 3 according to the result of the error detection for the coded control signal.

The data processor 7 receives the coded control signal from the demodulator 25 and then, performs coherent detection for this control signal, resulting in the control data. The control data (C) is inputted into the main controller 9.

The data processor 7 further performs error detection for the control data (C) and supplies the result (ER) of detection to the main controller 9.

The main controller 9 controls the radio receiver block 3 and the radio transmitter block 4 according to the control

signal. The controller 9 controls the supply power controller 5 also according to the result of the error detection.

The control of the supply power controller 5 is carried out in the following way:

As shown in Fig. 2, the supply power controller 5 includes a window comparator 51, a current limiter 52 and a resetter 53.

The data processor 7 has an error detector 71. This error detector 71 receives the coded control signal from the demodulator 25, detects any error therein, and sends the result of the error detection, i.e., an error rate signal (ER), to the main controller 9.

The main controller 9 has an error-rate/voltage (ER/V) converter 91. This (ER/V) converter 91 converts the error rate signal (ER) of the received control data to a voltage signal (V). The voltage signal (V) is inputted to the window comparator 51 of the supply power controller 5.

The window comparator 51 compares the inputted voltage signal (V) with three reference voltages V_{r1}, V_{r2} and V_{r3} and outputs the result of the comparison.

The current limiter 52 decreases or limits in steps the supply current to the radio receiver 3 according to the result of the comparison.

The resetter 53 receives a reset signal (R) from the main controller 9 to stop the current decrease or limit action of the current limiter 52, providing the original or essential supply current to the radio receiver block 3.

Next, the operation of the mobile communication system according to the first embodiment will stated below.

During standby and talking times, a radio wave transmitted from a base radio station is intercepted by the antenna 1 and a resultant RF input signal is fed through the duplexer 2 to the RF amplifier 21 in the radio receiver block 3. The RF input signal is amplified by the RF amplifier 21, frequency-mixed by the mixer 22 with a local signal produced by the local oscillator 23, IF-amplified by the IF amplifier 24, and demodulated by the demodulator 25, sequentially.

During the standby time, since the radio wave contains only the coded control signal, no voice signal is derived from the demodulated input signal from the demodulator 25, producing no voice or sound at the speaker 8.

The data processor 7 receives to process the demodulated input signal, deriving the coded control data (C) therefrom. The control data (C) is sent to the main controller 9 to be used for controlling the mobile communication system itself.

The error detector 71 of the data processor 7 also receives the demodulated input signal to detect possible

errors that will be found in the coded control data (C). The error detector 71 then calculates the error rate of the data (C) based on the detection result, and outputs the error-rate signal (ER) to the (ER/V) converter 91 in the main controller 9.

The (ER/V) converter 91 converts the error rate signal (ER) to a voltage signal (V) that changes dependent upon the error rate value ER. The voltage signal (V) thus produced is inputted to the window comparator 51 of the supply power controller 5.

In the window comparator 51, the inputted voltage value V is compared with three reference voltage values V_{r1}, V_{r2} and V_{r3} where $V_{r1} < V_{r2} < V_{r3}$. Four states or levels of the reception performance are therefore defined corresponding to four cases of (1) $V > V_{r3}$, (2) $V_{r2} < V \leq V_{r3}$, (3) $V_{r1} < V \leq V_{r2}$, and (4) $V \leq V_{r1}$. The comparator 51 outputs four current limiting signals S4, S3, S2 and S1 that correspond to the cases of $V > V_{r3}$, $V_{r2} < V \leq V_{r3}$, $Vr1 < V < V_{r2}$, and $V \leq V_{r1}$, respectively, as the result of the comparison.

The current limiter 52 alternately provides the supply current having four current values I_4, I_3, I_2 and I_1 corresponding to the reception states of $V > V_{r3}$, $V_{r2} < V \leq V_{r3}$, $V_{r1} < V \leq V_{r2}$, and $V \leq V_{r1}$, where $I_4 > I_3 > I_2 > I_1$.

Therefore, in the case of $V \leq V_{r1}$, the error rate value

ER is extremely low, that is, the reception state of the communication system is very good. Therefore, the supply current is set as the lowest value I_1, enabling to reduce most effectively the power consumption of the radio receiver block 3.

If the value ER increases slightly due to decrease in radio wave strength, increase in noise or the like, the supply current is set as the value I_2 greater than I_1. Thus, reception performance of the system is improved so that the radio wave from the base station is ensured to be received. The current value I_2 is held under the condition that $V_{r1} < V \leq V_{r2}$ is maintained.

When $V_{r1} < V \leq V_{r2}$ is not maintained in spite of the current value I_2, the reception performance is not sufficient and therefore, the supply current is further increased to the value I_3 greater than I_2.

Similarly, the current value I_3 is held under the condition that $V_{r2} < V \leq V_{r3}$ is maintained. When $V_{r2} < V \leq V_{r3}$ is not maintained, i.e., $V > V_{r3}$ is established, in spite of the current value I_3, the reception performance is not yet sufficient and therefore, the supply current is further increased to the value I_4 greater than I_3 to ensure the good reception of the radio wave. The value I_4 is equal to the original current value necessary for the normal communication

operation, resulting in no power consumption of the radio receiver block 3.

The following is a concrete example, in which the error rate value ER and the voltage signal value V satisfy the following relationships, and the reference voltages V_{r1}, V_{r2} and V_{r3} are set as 0.5 volts, 1.5 volts and 2.5 volts, respectively.

$50\ \% \leq ER$	$V = 5.0$ volts
$10\ \% \leq ER < 50\ \%$	$V = 4.5$ volts
$5\ \% \leq ER < 10\ \%$	$V = 4.0$ volts
$1\ \% \leq ER < 5\ \%$	$V = 3.5$ volts
$0.5\ \% \leq ER < 1\ \%$	$V = 3.0$ volts
$0.1\ \% \leq ER < 0.5\ \%$	$V = Vr3 = 2.5$ volts
$0.05\ \% \leq ER < 0.1\ \%$	$V = 2.0$ volts
$0.01\ \% \leq ER < 0.05\ \%$	$V = Vr2 = 1.5$ volts
$0.005\ \% \leq ER < 0.01\ \%$	$V = 1.0$ volts
$0.001\ \% \leq ER < 0.005\ \%$	$V = Vr1 = 0.5$ volts
$ER \leq 0.001\ \%$	$V = 0$ volts

Therefore, the supply current value to the radio receiver block 3 is set as follows corresponding to the error rate value ER:

$ER < 0.005\ \%$ $\quad I_1$

$0.005\ \% \leq ER < 0.05\ \%$ $\quad I_2$

$0.05\ \% \leq ER < 0.5\ \%$ $\quad I_3$

$0.5\ \% \leq ER$ $\quad I_4$

If a call signal from a base station is received by the radio receiver block 3 during the standby time under the consumption power reduction, a reset signal (R) is sent from the main controller 9 to the resetter 53. In response to the signal (R), the resetter 53 stops the current decrease or limit action by the current limiter 52, providing the original or essential supply current I_4 to the radio receiver block 3 in order to ensure the native reception performance of the receiver block 3.

In the case of transmission, the main controller 9 sends a reset signal (R) to the resetter 53 by the operation of the user. Thus, the original or essential supply current I4 is fed to the radio receiver block 3 in the same way as above. Then, a voice signal, which is produced by the microphone 10, is subjected to AF-amplification, frequency-conversion, and power-amplification in the radio transmitter block 4 and is irradiated through the duplexer 2 and the antenna 1 to the atmosphere as a radio wave.

As described above, with the mobile communication system

of the first embodiment, the supply current to the radio receiver block 3 is reduced or limited according to appearance of errancy of the control data, i.e., the error rate value ER. For this reason, the supply current can be controlled objectively and automatically corresponding to the actual reception state of the receiver block 3.

As a result, the supply current can be reduced as much as possible under the condition that the radio wave from the base station is ensured to be received, providing the satisfactory effect or advantage of the power consumption reduction without reception performance deterioration.

In addition, since the resetter 53 is provided in the supply power controller 5 to stop the supply current reduction by the reset signal (R), the native current or power can be supplied to the receiver block 3 promptly at the call signal reception and at the radio signal transmission.

Although the reception state is divided into four steps or levels in the first embodiment, it may be divided into any other steps than four.

SECOND EMBODIMENT

Fig. 3 shows a supply power controller of a mobile radio communication system and its vicinity according to a second embodiment of the invention.

As shown in Fig. 3, this system has the same

configuration as that of the first embodiment other than that a supply power controller 5a.

The supply power controller 5a includes a window comparator 55 that compares the inputted voltage signal value V with one reference voltage value V_{r11} (= 2.5 volt, for example) and outputs the result of the comparison and a current limiter 56 that limits the supply current to the radio receiver block 3 according to the comparison result.

In the window comparator 55, the inputted voltage value V is compared with the single reference voltage value V_{r11}, and two states or levels of the reception performance are therefore defined corresponding to two cases of (1) $V > V_{r11}$ and (2) $V \leq V_{r11}$. The comparator 55 outputs two current limiting signals S12 and S11 that correspond to the cases of $V > V_{r11}$ and $V \leq V_{r11}$, respectively, as the result of the comparison.

The current limiter 56 alternately provides the supply current having two current values I_{12} and I_{11} corresponding to the reception states or levels of $V > V_{r11}$ and $V \leq V_{r11}$, where $I_{12} > I_{11}$.

In the case of $V > V_{r11}$, the signal S2 is inputted into the current limiter 56 so that the supply current is increased continuously or incrementally until the signal S1 is inputted thereinto due to the decrease of the error rate

value ER.

Similarly, in the case of $V \le V_{r11}$, the signal S1 is inputted into the current limiter 56 so that the supply current is decreased continuously or incrementally until the signal S2 is inputted thereinto due to the increase of the error rate value ER.

Thus, the supply current is designed to be kept automatically at a value corresponding to the reference voltage value V_{r11}.

The system of the second embodiment can provide the same effect or advantage since it is substantially the same in configuration as that of the first embodiment.

While the preferred forms of the present invention have been described, it is to be understood that modifications will be apparent to those skilled in the art without departing from the spirit of the invention. The scope of the invention, therefore, is to be determined solely by the following claims.

CLAIMS

1. In a mobile radio communication system having a radio receiver for receiving a radio wave transmitted from a base station to produce an input signal, and a supply power controller for controlling a supply power supplied to said radio receiver, said system comprising:

an error detector for detecting an error in a control signal derived from said input signal; and

a supply power controller for controlling to reduce a supply power to said radio receiver during a standby time according to appearance of errancy of said control signal.

2. The system as claimed in claim 1, wherein said error detector detects to calculate an error rate of said control signal, and said supply power controller controls to change said supply power according to the result of comparison.

3. The system as claimed in claim 1, further comprising a resetter for stopping supply power reduction action of said supply power controller, wherein said resetter is driven at reception of a call signal and at transmission.

4. In a mobile radio communication system having a radio

receiver for receiving a radio wave transmitted from a base station to produce an input signal, and a supply power controller for controlling a supply power to said radio receiver, said system comprising:

an error detector for detecting an error in a control signal derived from said input signal to calculate an error rate of said control signal;

a converter for converting said error rate to an electric signal;

a comparator for comparing said electric signal with at least one reference; and

a supply power controller for controlling to reduce a supply power to said radio receiver during a standby time according to the result of comparison.

5. The system as claimed in claim 4, wherein said supply power is changed in steps dependent upon said result of comparison.

6. The system as claimed in claim 4, further comprising a resetter for stopping supply power reduction action of said supply power controller, wherein said resetter is driven at reception of a call signal and at transmission.

7. A mobile radio communication system comprising:

an antenna for intercepting a radio wave transmitted from a base station to produce an input signal;

a radio receiver for receiving said input signal to reproduce a transmitted voice signal;

a data processor for processing a control signal derived from said input signal to obtain a control data;

a radio transmitter for producing to transmit an output voice signal through said antenna;

a supply power controller for controlling a supply power to said radio receiver;

an error detector for detecting an error contained in said control signal; and

a main controller for controlling said radio receiver, said radio transmitter, and said supply power controller, said main controller being controlled by using said control data;

wherein

said supply power controller controls to reduce said supply power to said radio receiver according to appearance of errancy of said control signal.

8. The system as claimed in claim 7, wherein said error detector calculates an error rate of said detected error, and

said supply power controller controls to reduce said supply power to said radio receiver according to said error rate.

9. The system as claimed in claim 8, further comprising a converter for converting said error rate to an electric signal;

a comparator for comparing said electric signal with at least one reference; and

a limiter for limiting said supply power to said radio receiver according to the result of comparison in said comparator.

10. The system as claimed in claim 7, further comprising a resetter for stopping supply power reduction action of said supply power controller, wherein said resetter is driven at reception of a call signal and at transmission.

11. The system as claimed in claim 9, wherein said comparator compares said electric signal corresponding to said error rate with a plurality of said references to define a plurality of error levels according to the result of comparison, and wherein said supply power controller supplies different and constant powers to said radio receiver corresponding to said plurality of error levels.

12. The system as claimed in claim 9, wherein said comparator compares said electric signal corresponding to said error rate with a single reference to define two error levels according to the result of comparison, and wherein said supply power controller supplies different and varying powers to said radio receiver corresponding to said two error levels.

13. A radio receiver comprising;

a receiver circuit for receiving a radio wave transmitted from a base station to produce an input signal;

an error detector for detecting an error in a control signal derived from said input signal; and

a power supply controller for controlling power supplied to said receiver circuit and reducing said power supplied to said receiver circuit during standby time according to the error rate in, or the appearance of errancy of, said control signal.

14. A mobile radio communication system comprising a radio receiver as defined in claim 13.

15. A radio receiver comprising;

a receiver circuit for receiving a radio wave transmitted from a base station to produce an input signal;

a power supply controller for controlling power supplied to said radio receiver;

an error detector for detecting an error in a control signal derived from said input signal to calculate an error rate of said control signal;

a converter for converting said error rate to an electric signal; and

a comparator for comparing said electric signal with at least one reference;

in which the power supply controller reduces the power supplied to said receiver circuit during standby time according to the result of the comparison.

16. A mobile radio communication system comprising a radio receiver as defined in claim 15.

17. A radio receiver substantially as described herein with reference to the drawings.

18. A mobile radio communication system substantially as described herein with reference to the drawings.

Patents Act 1977
Examiner's report to the C mptroller under Section 17
(The Search report)

Application number
GB 9513340.1

Relevant Technical Fields

(i) UK Cl (Ed.N) H4L (LECTP); G4H (HRCA)

(ii) Int Cl (Ed.6) H04Q (7/18, 7/32); H04M (1/72)

Search Examiner
MR N HALL

Date of completion of Search
6 SEPTEMBER 1995

Databases (see below)
(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii) ONLINE: WPI

Documents considered relevant following a search in respect of Claims :-
1-18

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages	Relevant to claim(s)
A	GB 2261140 A (MOTOROLA)	
A	GB 2250402 A (MATSUSHITA)	

Databases:The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).